

---

## THE UNDERGRADUATE PHYSICS CURRICULUM IN THE ENGINEERING COLLEGE

DUDLEY WILLIAMS

*Department of Physics, The Ohio State University, Columbus 10*

As the details of the physics curriculum vary widely in the various engineering colleges throughout the country, this paper will be restricted to only two phases of the engineering physics curriculum. The first part of the paper deals with general trends in the development of introductory physics courses in various engineering colleges. The second part of the paper gives a brief description of

THE OHIO JOURNAL OF SCIENCE 52(5): 244, September, 1952.

the physics courses offered in Engineering Physics Curriculum at The Ohio State University. No attempt to give a complete survey of engineering physics curricula is made.

In surveying the introductory physics courses offered at various institutions, one observes three major trends. The first of these involves the devotion of more time to the introductory courses. For many years, Massachusetts Institute of Technology has offered a two year course in general physics. This has also been customary in many of the Canadian universities. Vanderbilt University has recently adopted a course of this type. At the Ohio State University, the engineering physics students take an introductory physics course equivalent to approximately one and two-thirds years (24 quarter hours) of the conventional one year 5-hour course. Institutions now offering a 3-semester course in introductory physics include Carnegie Tech and Northwestern University. An 18-quarter hour course is offered at the Georgia Institute of Technology.

A second trend lies in the tendency toward a more mathematical treatment of the subject. In the MIT course the calculus has long been used from the

TABLE 1

	Autumn	Winter	Spring
Second Year (Introductory Physics)	Mechanics (5) E. and M. (4)	Heat, Sound, Light (5) E. and M. (5)	E. & M. (4)
Third Year	Geom. Optics (3)	Physical Optics (3)	"600" Elective (3)
Fourth Year	Heat and Thermo- dynamics (3) Intermediate Mechanics (3) "600" or "700" Elective (3)	Wave Motion and Sound (3) Intro. Quantum Mechanics (3) "600" or "700" Elective (3)	Kinetic Theory (3) "600" or "700" Elective (3)
Fifth Year	Nuclear Physics (3) X-rays (3)	Atomic Spectra (3) Elective (3)	Molecular Spectra(3) Elective (3)

beginning. Now that introductory calculus courses are being offered in the Freshman year in many institutions, other physics departments are able to employ the calculus earlier than had hitherto been possible. At Ohio State the engineering students have a brief introduction to the differential and integral calculus during their first year at the University. In the physics course, which comes during the second year, the use of the calculus is introduced gradually in order to permit the student to "catch his breath" before applying his newly acquired mathematical skills. However, many of the brighter students are somewhat impatient with this delay and would prefer to make full use of their mathematics from the outset; some of the staff members prefer to delay full employment of the calculus in the thought that its too early use tends to divert the student's attention from the basic physical principles that form the core of the course.

The third trend in the introductory courses lies in the employment of the MKS system of International Metric Units so long advocated by the electrical engineers. Toward this change many physics instructors have been lukewarm if not openly hostile. However, there is strong pressure, originally from the engineers and now from physicists themselves, to adopt this system—with the electrical units in their so-called "rationalized" form. The writer's experience in teaching a course in which these units are employed indicates that considerable time is saved by defining the *joule* and *watt* from the outset instead of first defining the

*erg* and *erg/sec* and then stating the "practical" work and power units as multiples as has been customary in the past. The advantage of the MKS system in introducing the electrical units is, of course, obvious. However, it does come as a shock to one brought up on the CGS system to see Planck's constant given in *joule seconds* and to express *e/m* in *coulombs/kilogram*!

As for the Engineering Physics Curriculum at the Ohio State University, it should be pointed out that *the engineering program of study is now a five-year program*. The engineering physics student takes no physics during his first year. During the subsequent years the program of physics courses with quarter hours of credit is given in table 1.

The "600" electives may include the following courses: Design and Theory of Optical Instruments, Advanced Electricity, Conduction of Electricity through Gases, Thermionics, Electromagnetic Field Theory, Introductory Nuclear Physics, Advanced Laboratory Work, Experimental Infrared Spectroscopy, Nucleonic Instrumentation, and Physical Meteorology. The "700" electives include: Minor Problems in Physics (an individual "special project"), Methods of Quantum Mechanics, and Introduction to Theoretical Physics.

As far as course work is concerned, the program given above, together with supporting courses in mathematics, chemistry, engineering, and "non-technical" courses in social sciences and humanities is equivalent to the course work taken by graduate students taking the M. S. degree—except for the fact that a thesis is not required. By doing additional work in the last two years and by writing a thesis, the superior student can actually receive a master's degree at the same time he receives his B. S. degree in Engineering Physics.

---